EGG CAPSULE MORPHOLOGY OF *ANISOMORPHA BUPRESTOIDES* (PHASMATODEA: PSEUDOPHASMATIDAE)[1]

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ABSTRACT: Egg capsule morphology of the stick insect *Anisomorpha buprestoides* (Stoll) is observed with scanning electron microscopy. The length of the capsule is 2.61 mm and the width is 1.82 mm. The irregular capsule surface is covered throughout with smooth tubercles and scattered umbrella-like projections. These projections may represent a unique feature for this species.

The eggs of many stick insects remain unstudied at both the light microscopy and scanning electron microscopy (SEM) levels. Due to lower resolution capabilities, light microscope studies of stick insect capsules tend to present surface features less accurately and in less detail. With the use of SEM, however, the structure of the capsule can be observed closely and in great detail.

According to Viscuso and Longo (1983), morphological characteristics of the chorion should provide useful data for taxonomic and phylogenetic purposes, and this viewpoint is supported by recent SEM studies on eggs of stick insects (Godeke and Pijnacker, 1984; Mazzini *et al.*, 1984; Mazzini and Scali, 1977, 1980; Scali and Mazzini, 1977, 1982, 1983; Stark and Lentz, 1986). Using light microscopy, Clark (1976) studied the eggs of many stick insects, including *Anisomorpha buprestoides* (Stoll), a species common in Mississippi and other southeastern states. In this study we define the ultrastructure of the egg capsule of *A. burprestoides* at the SEM level and add information to Clark's (1976) light microscopy study.

MATERIALS AND METHODS

Eggs of the stick insect, *A. buprestoides,* were obtained from a caged female collected in Hinds County, Mississippi, during October, 1985. Eggs were placed in 70% ethanol and examined under a dissecting stereomicroscope. If debris was detected, the eggs were placed in distilled water and agitated in an ultrasonic cleaner for 30 sec. The eggs were dehydrated in acetone, air-dried, placed directly on specimen stubs with silver conducting paint, and coated with a 40 nm layer of gold using a Hummer II Sputter Coater set for 2 min at 10 mamp. The eggs were studied with an AMRay

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1000 scanning electron microscope with the stage tilted at a 45° angle and an accelerating voltage of 20 KeV. Micrographs (Figs. 1-12) are listed with original magnifications; terminology follows Clark (1976).

RESULTS

The overall appearance of the egg capsule of *A. buprestoides* is shown in Fig. 1. The eggs are black with a mean capsule length of 2.61 ± 0.1 mm (range = 2.4-2.7) and a mean width of 1.82 ± 0.04 mm (range = 1.77-2.0). The chorionic surface consists of many irregular ridges and valleys covered with smooth tubercles (Fig. 2) which vary in size and are interconnected by thin filaments (Fig. 3). Elevated, large, umbrella-like projections resembling liverwort antheridiophores (Fig. 4) are scattered in groups of two or more over the surface (Fig. 5). Each projection consists of a smooth stalk and an irregular, warty anterior surface. Openings or punctations appear to be present on the anterior portion of these projections (Fig. 6).

The elliptical operculum (op) is convex, consisting of a flat peripheral rim and a central area with the same surface characteristics as the capsule (Figs. 7, 8). Capitular structures are absent.

The micropylar plate (mp) is a concave structure 0.9 mm long and 0.4 mm wide, surrounded by an elevated rim on the mid-dorsal surface of the egg (Figs. 1, 9, 10). The mp surface is similar to that of the capsule, except the umbrella-like projections are absent (Figs. 10, 11). The median line (ml) extends 0.3 mm from the base of the micropylar plate to the posterior pole of the capsule (Figs. 1, 10). An irregular median tubercle (mt) lies just above the indistinct micropylar cup (mc) (Fig. 10). Micropylar orifices are absent.

The porous exochorion (ex) is less than 0.01 mm thick and contains numerous large spaces (Fig. 12). The endochorion (en) has a thickness of 0.2 mm and consists of a dense meshwork of closely packed fibers without interstitial spaces (Fig. 12).

DISCUSSION

The information presented here is the first report of egg capsule morphology of *A. burpestoides* using SEM. While confirming all the main structures described by Clark (1976) using light microscopy, more specific capsule characteristics were revealed with SEM. Clark's (1976) reference to a "mottled surface" actually consists of numerous tubercles with umbrella-like projections. These projections are scattered over the surface of the egg capsule and operculum but are absent on the micropylar plate. The umbrella-like projections are presently known to occur only on the egg of this species. Although their exact function is not known, they may serve

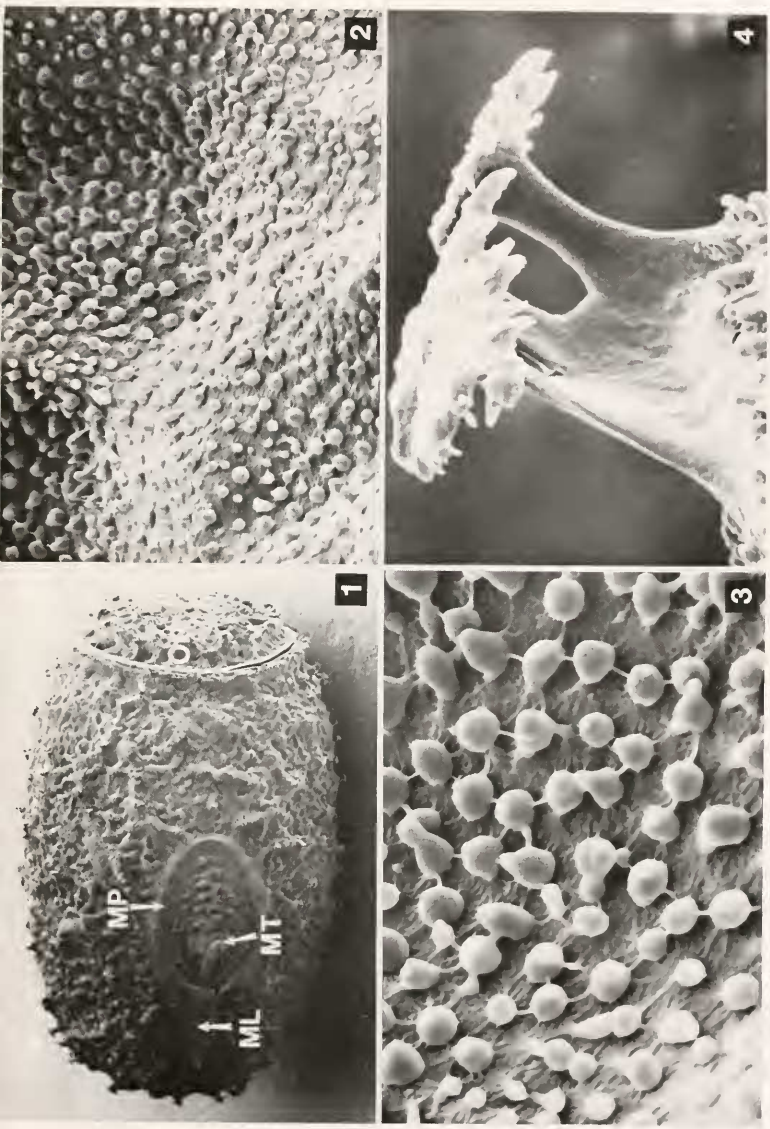

Fig. 1. *Anisomorpha buprestoides* egg capsule, dorsal aspect (32 X), ml = median line, mt = median tubercle, mp = micropylar plate, op = operculum (terminology follows Clark, 1976).
Fig. 2. Egg capsule surface, showing smooth tubercles (990 X).
Fig. 3. Egg capsule surface detail, showing connecting filaments between tubercles (1980 X).
Fig. 4. Umbrella-like projections on the egg capsule surface (1440 X).

Fig. 5. Egg capsule surface, showing clustering of umbrella-like projections (308 X).
Fig. 6. Umbrella-like projections, showing irregular, warty anterior surface and smooth stalk (2420 X).
Fig. 7. Operculum showing its overall concavity and indentations adjacent to the rim (50 X). op = operculum, r = rim.
Fig. 8. Detail view of isolated operculum (60 X).

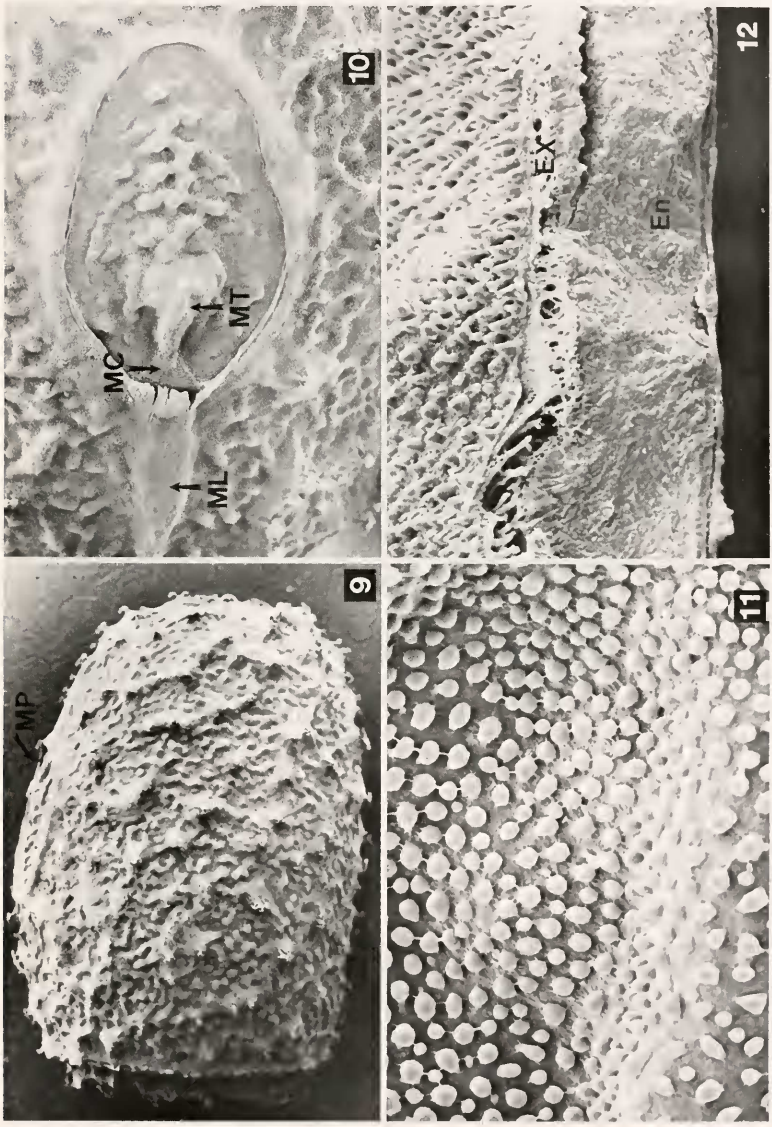

Fig. 9. Side view of egg capsule showing concavity of the micropylar plate (mp) and elevated rim (36 X).
Fig. 10. Micropylar plate (68 X). ml = median line, mc = micropylar cp, mt = median tubercle.
Fig. 11. Detail of micropylar plate surface showing tubercles connected by filaments (1350 X).
Fig. 12. Broken edge of shell (1080 X). ex = exochorion, en = endochorion. Note tubercles projecting from the chorionic surface.

as a means of substrate attachment or for respiration, since they apparently contain openings. Unfortunately, these data do not permit testing of Bradley and Galil's (1977) placement of *Anisomorpha* within Pseudophasmatidae, since no egg data are available for other members of the family. However, the operculum structure is more similar to that of the bacillid genera, *Bacillus* and *Clonopsis* (Scali and Mazzini, 1977; Mazzini and Scali, 1977), than to known heteronemiid, phasmatid or phyllid genera. This is consistent with current placement of Bacillidae and Pseudophasmatidae within the suborder Areolatae (Bradley and Galil, 1977).

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